

# Thomas concludes one experiment, records space walks

U.S. Astronaut Andy Thomas is continuing his scientific research as his Mir 25 crew mates perform space walks to install handrails and foot restraints on the damaged Spektr module and replace the propulsion system for the Mir's boom jet assembly.

Thomas has finished the immunity experiment, for which he was taking blood and saliva samples. The life science investigation is comparing the human body's ability to produce antibodies to fight illness in a microgravity environment and on Earth. Previous research has shown that some of the body's immune responses appear to be suppressed during long-duration space flight. Astronauts Shannon Lucid, John Blaha, Jerry Linenger, and Dave Wolf also participated in this investigation during their research aboard Mir.

The Australian-born astronaut also continued to troubleshoot the Biotechnology System Co-Culture experiment, designed to grow two different cell types in order to form three-dimensional tissue samples in microgravity. Thomas opened up the hardware in an effort to gain insight into the location of a possible

blockage in the fluid loop. Thomas reported that he found dry, dark-colored matter in one of the tubes of the apparatus.

Thomas processed 12 samples for the material science experiment, the Queens University Experiment in Liquid Diffusion, a joint U.S., Canadian and Russian experiment that uses a special furnace to analyze the slow mixing of materials by the random movement of molecules of one substance into another.

Another "Letter from the Outpost" was posted on the NASA Shuttle-Mir Web (<http://shuttle-mir.nasa.gov>) by Thomas, as well. In it, he discussed setting up his living and working quarters aboard the station and learning about the challenges of long-term life in microgravity as he unpacked books, music cassettes and CDs, plus stationary supplies, and personal hygiene items.

"As I was unpacking and stowing all of these things, I came up against the one thing that makes space flight both interest-

ing and, at the same time, very frustrating, namely zero gravity," Thomas wrote. "It can be a joy to experience, but also can really make your work day difficult. The most frustrating thing is that you are forever losing things. You might be rummaging through a bag to find one item, while all the other contents are floating away, and before you know it, they are gone, and lost.

"They may even be close by to you, but as you look around you tend to focus your gaze only on surfaces, where we are accustomed to seeing things, and not look at the empty space just in front of us. In zero-g you have to learn to change this behavior."

Thomas was in the Mir's Core Module, monitoring the progress of the cosmonauts and shooting video when Commander Talgat Musabayev and Flight Engineer Nikolai Budarin, opened the airlock hatch with no difficulty April 1 and began a six and one half hour space walk. The crew installed handrails

and foot restraints on the Spektr module near the radiator, then moved to its damaged solar array to begin installing a work station but ran short on time.

A second spacewalk to complete the array work occurred April 6. Three more spacewalks are planned April 11, 16 and 21 to replace the propulsion system for Mir's boom jet assembly, known as the "Sofora." The old propulsion system atop the boom which rises from the Kvant-1 module has been operating since its delivery to the station in August 1992, and is almost out of fuel. This replacement work is expected to span four space walks, spaced about five days apart.

"I had the armchair view of it all because I was in the module where I am now looking out the windows that are in this module and watching the whole proceedings unfold," Thomas said, "and it was really fascinating to watch my two colleagues moving around outside in the pressure suits and handling the equipment and doing the work out there."

Thomas is to return to Earth in early June.



## STS-90 reflects sophistication, Searfoss says

(Continued from Page 1)

KSC's Shuttle Landing Facility.

"I'm very excited to see continual progress and development in our ability to get world class rigorous science up on orbit," Searfoss said. "We are molding some rigorous scientific requirements to get great data up on orbit with the difficult operational aspect of being in space and doing the job up there."

STS-90 is to last 15 days, 21 hours, 50 minutes. But mission managers are reserving the option of extending the flight one additional day for science operations if shuttle electrical power margins permit.

Neurolab will study the effects of microgravity on the human central nervous system, and pathways that control the ability to sense location in the absence of gravity, and the effect of microgravity on a developing nervous system. Searfoss said it has set a new standard for inter-agency and external cooperation.

"This mission was developed and designed with the National Institutes of Health firmly involved in the selection of payloads," Searfoss said. "Out of 170 candidate experiments to fly on Neurolab, it was approved down to 26 based on the ones that were the most promising in terms of scientific return. That process was not done at the NASA level, it was done at an international level with our international investigators, academic institutions as well as the National Institutes of Health.

"We're reaching a new level of detail and sophistication of what we're able to do on orbit to develop some really fundamental how and why aspects of the scientific questions we're asking," Searfoss said. "We're much more on the leading edge to science in the kind of work we do up on orbit these days, and it's exciting to see that."

An April 16 launch and a 16 or 17 day mission would have *Columbia* landing back at Kennedy Space Center on May 2 or May 3.



JSC Photo 98-03937 by Steve Candler

**Brian O'Hagan, second from left, transmits the first command to the new International Space Station from the Mission Control Center's Command and Data Handling System, or ODIN, console at JSC with help from Larry Bishop, Kevin Mutz and Craig Davis, from left.**

## Rack installation another important station milestone

(Continued from Page 1)

ization and other support systems for the science racks.

"The installation of this first system rack represents another major milestone for the space station program," said Steve Goo, Boeing manager for the U.S. lab. "This marks the point where we are actually gathering data and providing power at a total lab level with the racks and module working together. This is significant in terms of driving down technical risks."

The space station racks are about the size of a closet. The first rack installed in the lab weighs about 1,200 pounds. Its exterior is made of graphite composite.

Over the next several months, 10 more system racks will be installed inside the lab. The laboratory module then will be shipped to Kennedy Space Center this August to begin final preparations for its launch,

scheduled for May 1999 aboard the Space Shuttle Endeavour on STS-98, station assembly flight 5A.

When it is launched aboard the shuttle, the laboratory module will have just five of the 11 system racks inside it. Then, on the following shuttle flight, STS-99 scheduled for June 1999, the six additional system racks will be delivered in a smaller module called the Multi-Purpose Logistics Module. The 11 system racks support the 13 interchangeable science racks inside the lab and provide the communication and control capability for the space station.

Another major milestone for the laboratory module currently under way is the beginning of hardware and software integration and a series of qualification tests being performed leading up to the lab's shipment to the Kennedy Space Center in August.

## Houston sends first command to station element

The first command from Mission Control to International Space Station hardware—in a test stand at the Kennedy Space Center—was sent at 7:25 p.m. CST March 5 as part of an end-to-end checkout of the station's Early Communication System.

The command was sent by Brian O'Hagan, the flight control team's Command and Data Handling System expert, call sign "ODIN," who has been instrumental in developing the MCC's space station commanding capabilities. Supporting O'Hagan were Larry Bishop, also an ODIN, responsible for development of onboard command and data handling procedures; Craig Davis, ISS command system engineer; and Kevin Mutz, Boeing Development Manager for the flight software.

"ECOMM is a fast-track project being provided to the program as government furnished equipment by Engineering's Avionic Systems Division. The ECOMM system will be flown on STS-88 to provide an early capability for commands, telemetry and two-way videoteleconferencing," said Linda Bromley, ECOMM project manager. The test was performed during the checkout portion of the Launch Package 2A Cargo Element tests being conducted at the Kennedy Space Center.

"I thought it went extremely well," Bromley said, "especially since most communication systems this complex can take four to seven years to develop and fly. But we were given only 18 months to build and fly this one."

Bromley said the members of the project team "basically gave up their personal lives" for a year and a half to develop and test the system. The success of this test was due in particular to the efforts of Mike Cooke, the ECOMM Project's avionics man-

ager; and Tex Ward, the Lockheed engineer responsible for ECOMM testing logistics, she said.

"Between 2A and the time the regular S-band system comes on line in 4A, the only communication we would have had was through Russian ground stations," Bromley said. "That limited the amount of time to about 10 minutes a day that we could have communication with the station. This new communication system goes through the TDRS (Tracking and Data Relay Satellite) system, so it allows nearly continuous monitoring of the status and health of the vehicle, and it allows you to send up commands to some systems without using ground stations. It also allows two-way videoteleconferencing between the crew and mission control or their families."

The first videotelecon between the MCC and the first U.S.-built element of the station that same evening was hosted by STS-88 crew members Jerry Ross and Jim Newman.

"The ECOMM end-to-end test was a significant and successful milestone for the 2A team," said Beth Cerrato, the 2A Launch Package Manager's Team member responsible for coordinating testing. "Actually 'seeing' the results of this test in the videotelecon made it even more rewarding for the entire team. We will be looking forward to seeing this system operational on orbit—it is a valuable addition to our flight both on orbit and on the ground."

"Getting the control center to communicate with our new space station via the Early Comm System was the result of significant efforts by development and operations organizations from across the program," said Mark Kirasich, lead ISS flight director for STS-88. "It was a testament that we are indeed getting ready to fly."

## Internet News

**By Lori Keith**

Using the Internet, NASA is making connections to thousands of classrooms across the country and around the world as part of NASA's Learning Technologies Program.

Space Team Online is one of the projects under way. A K-12 Educational Initiative sponsored by NASA, it began in the spring of 1997, as Shuttle Team Online changing its name in December. The name change is to encompass the involvement of the activities of the International Space Station, as well as shuttle missions.

Space Team Online is an educational World Wide Web site set up for upper elementary through high

school students and teachers to use interactively in the classroom. It's one place that teachers, students, space scientists and others involved in the overall space goal can personally interact.

The majority of experts are from JSC and Kennedy Space Center. JSC hopes to expand its experts list for the volunteer project with participation from more of those involved in shuttle or station missions.

"This project is important, not just because is a HEDS (Human Exploration and Development of Space) goal, but because our nation's minds are asking for more," said Bill Boyd, acting chief of Engineering's Energy Systems Test Branch. "If we can't

accept that as a challenge, then we are not ready for the challenge of [space] exploration."

A biography is written, sharing some personal and background information, and short journals are periodically submitted detailing a current project, event, problem or day-to-day activities.

Because of time constraints, a journalism student has been recruited to conduct interviews and do the actual writing of the bios and journals, when preferred. Boyd said having an interviewer helps to facilitate the whole process. The must approve the final product before it is put on the web.

"It does take some time, but not

an excessive amount," Boyd said. "An hour for the interview, an hour to review the bio. Perhaps one-half to one hour per week to keep the journals updated. Those are insignificant numbers compared to the gain."

Experts also may participate in web chats, where they are the featured guest and respond to questions in real time on the Internet. Approximately four chats a month are planned. E-mail question and answers are a popular part of the project with more than 1,000 E-mail questions so far.

Kurt Bush, an engineering associate in the Flight Crew Systems Development Program, said, "I think the kids are getting a lot out of this.

Very rarely do I answer questions from adults."

Children ask all kinds of questions, limited only by their imagination and intelligence.

"I always wanted stuff like this when I was a student," Bush said. "Now I have the chance to do it for the other kids—sharing all the neat stuff I wanted to see and know about when I was a kid."

Though participation is voluntary, the goal is to ensure that JSC is well represented. About 45 JSC volunteers are involved so far. Anyone interested in participating in the STO program can contact Lori Keith at x3622. The website is at <http://quest.arc.nasa.gov/space/>.